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The Talpidae (Insectivora, Mammalia) of Eggingen-Mittelhart (Baden-Württemberg, F.R.G.) with special reference to the *Paratalpa-Desmanodon* lineage

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With 4 plates, 8 figures, 4 tables

Summary

The talpid fauna of the Upper Oligocene localities Eggingen-Mittelhart 1 and 2 has been studied. A new genus, *Hugueneya,* is erected.

The *Paratalpa-Desmanodon* lineage is discussed. These genera can only be distinguished on the basis of the humerus.

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1. Introduction

During a visit to the Staatliches Museum für Naturkunde in Stuttgart in the autumn of 1986 Dr. E. Heizmann showed me a collection of talpids from Eggingen-Mittelhart 1 (Baden-Württemberg, F.R.G.). He kindly permitted me to use this collection in studies for my „doctoraal examen". During a later visit he lent me for my studies a collection from a second locality, Eggingen-Mittelhart 2.

The fauna and geology of these two localities will be discussed in the dissertation of J. Werner. Preliminary investigations show that both localities have approximately the same age as Coderet (MP 30) (Heizmann, pers. comm.).

Eggingen (formerly written Eckingen) has been known as a locality for fossil mammals since the last century. It is certain that the classical „Eggingen" is not the same as either Eggingen-Mittelhart 1 or 2, since these localities lie in relatively recently opened sand pits.

Acknowledgements

I am indebted to Dr. E. Heizmann for allowing me to study the Eggingen-Mittelhart material. During a trip to museums in Germany and Switzerland made possible by the Molengraaff-fund I was helped by Dr. V. Fahlbusch and Dr. K. Heissig (München), Dr. B. Engesser (Basel), and Dr. E. Heizmann and Dr. R. Ziegler (Stuttgart) who showed me material for comparison. The discussions with Dr. Engesser and Dr. Ziegler greatly helped to shape my ideas.

Further material for comparison was borrowed from Dr. P. Mein from Lyon and Dr. C. Doukas from Athens.

I am greatly indebted to Dr. Coja Rümke and Dr. Hans de Bruijn for their assistance and supervision.

The photographs were taken by W. den Hartog and retouched by J. Luteijn who also made the illustrations. Miss S. M. McNab made some linguistic improvements.

2. Methods and collections

The nomenclature for parts of molars used (fig. 1) follows Engesser (1980). It differs in three points. The anterior arm of the hypoconid is called the oblique cristid and not crista obliqua, because the term crista obliqua causes confusion. It seems better to confine the use of „crista" to ridges of the upper molars. A ridge of the lower molars should be referred to as „cristid". The posterolingual cusp of the upper molars is called the hypocone. In Talpidae this cusp is often considered to be the metaconule, whereas in other insectivore families the term hypocone is used (Soricidae, see Reumer, 1985; Dimylidae, see Müller, 1967). The homology of this cusp in the different families cannot be demonstrated. By using a different term for the Talpidae, however it is implicitly suggested that the cusps are not homologous. Two terms have been added to Engesser's terminology. The degree of development of the cristids bordering the talonid basin on the lingual side is considered to have taxonomical value. These cristids are called metacristid and entocristid following Hutchison (1974).

Engesser (op. cit.) gave no nomenclature for parts of the dental pattern of premolars. For the p4 and P4 the terminology of Rümke (1985) is used (fig. 1).

The abbreviations used for teeth are according to Jepsen's system, i.e. lower teeth in lower case letters and upper teeth in upper case letters, with the number on the line.

The maximum length and width have been taken at right angles for all elements. The elements have been orientated according to Rümke (1985). Orientating the M2 according to this method causes some problems, especially for those M2 in which the metacone has a long posterior arm. Therefore the M2 have been orientated along a line that connects the base of the paracone and the metacone (Hutchison, 1974).

Except for the collections of *Desmanodon antiquus*, all measurements were taken with a Reflex measuring microscope. A pair of x25 ocular lenses and x2 objectives was used. The collections of *D. antiquus* were measured on a Wild measuring microscope.

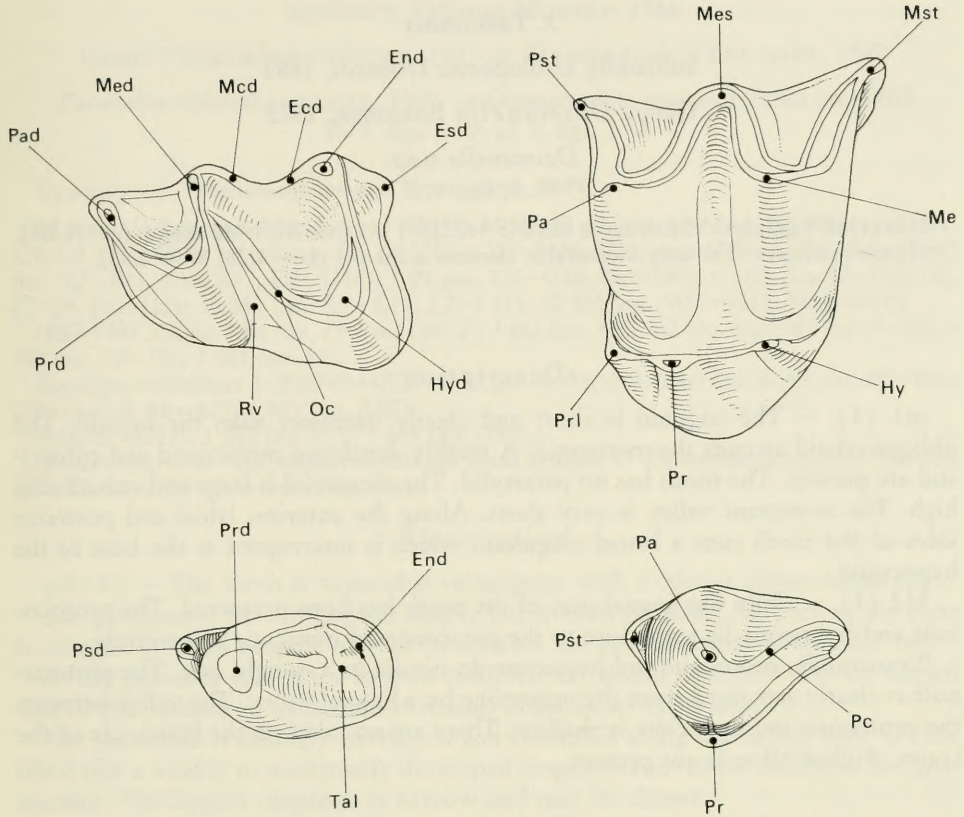

Fig. 1. Nomenclature for teeth as used in this study. Abbrevations:

Pad	=	paraconid	Pst	=	parastyle
Med	=	metaconid	Pa	=	paracone
Mcd	=	metacristid	Mes	=	mesostyle
Ecd	=	entocristid	Me	=	metacone
End	=	entoconid	Mst	=	metastyle
Esd	=	entostylid	Hy	=	hypocone
Hyd	=	hypoconid	Pr	=	protocone
Prd	=	protoconid	Prl	=	protoconule
Pc	=	posterocrista	Oc	=	oblique cristid
			Rv	=	re-entrant valley

The range and mean of the length and width are given (the width given for lower molars is always the width of the talonid). All measurements are in mm.

The collections from Eggingen-Mittelhart 1 are stored in the Staatliches Museum für Naturkunde in Stuttgart (SMNS Inv.-No. 44482) and in the Bayerische Staatssammlung für Paläontologie in München (BSP 1983 XXII). The collections from Eggingen-Mittelhart 2 are stored in the Stuttgart Museum (SMNS Inv.-Nos. 44721, 44722.

3. Taxonomy

Subfamily Urolopsinae DOBSON, 1883

Genus *Desmanella* ENGESSER, 1972

Desmanella n.sp.

Pl. 1, figs. 1, 2

Material: Eggingen-Mittelhart 2: (SMNS 44721): 1 m1 (no. B); 1 M2 fragm. (no. A B5).
Measurements: The only measurable element is the m1 (L = 1.25; W = 0.83).

Description

m1 (1). – The trigonid is short and clearly narrower than the talonid. The oblique cristid ascends the metaconid. A weakly developed metacristid and entocristid are present. The tooth has no parastylid. The entostylid is large and remarkably high. The re-entrant valley is very short. Along the anterior, labial and posterior sides of the tooth runs a broad cingulum, which is interrupted at the base of the hypoconid.

M2 (1). – Only the lingual part of the tooth has been preserved. The protoconule and hypocone lie very close to the paracone and metacone respectively.

Protoconule, protocone and hypocone do not lie in a straight line. The protoconule is clearly separated from the protocone by a lingual valley. The valley between the protocone and hypocone is shallow. There are no lobes on the labial side of the cones. A clear talon is not present.

Discussion

Although the M2 is fragmentary, this element permits determination at the genus level. The clearly defined lingual cusps which are not in a straight line indicate that we are dealing with a species of *Desmanella* rather than of *Asthenoscapter*.

One of the distinctions ENGESSER (1980) noted between *Desmanella* and *Asthenoscapter* is the presence of labial lobes („Wülste") between the lingual cusps of the M2 in *Desmanella*. Our specimen does not show this character. However, the absence of such lobes has also been noted in *D. engesseri* (ZIEGLER, 1985).

Judging by the size of the m1 the species from Eggingen is the smallest *Desmanella* known. The only two species that come close to it in size are *D. fejfari* from Rubielos de Mora 2 (GIBERT, 1975) and *D. engesseri* from Petersbuch 2. (These are also the two older species of *Desmanella*.).

Our m1 differs from those of *D. fejfari* in the weaker development of the entocristid and the discontinuous labial cingulum. Except for its smaller size the Eggingen species differs from *D. engesseri* in the more lingual termination of the oblique cristid, which steeply ascends the metaconid.

Although the material from Eggingen-Mittelhart 2 cannot be placed in any known species, the scarcity of the material does not permit the naming of a new species.

The material from Eggingen-Mittelhart 2 represents the oldest record of *Desmanella*.

Subfamily Talpinae Murray, 1866

Genus *Paratalpa* Lavocat, 1951 or *Desmanodon* Engesser, 1980

Paratalpa micheli Lavocat, 1951 or *Desmanodon antiquus* Ziegler, 1985

Pl. 1, figs. 6–9; pl. 2, figs. 1–4

Synonymy: *Teutonotalpa meyeri* Hutchison, 1974.

Material: Eggingen-Mittelhart 1: (SMNS 44482): 8 p4 (no. A7–A12, B7, B8); 4 m1 (no. C9, C8, C12, C13); 10 m2 (no. C7, C10, C11, D7–D10, D12, neue Grabung A1, A2); 20 m3 (no. E7–E11, E16, E17, D6–D18); 7 P4 (no. G7–G10, H7–H9); 11 M1 (no. I7–I10, I12, J7–J9, J10–J12); 10 M2 (no. K7–K11, L7–L11); 10 M3 (no. M12–M17, N14–N17).

(BSP 1981 XXII): 1 p4 (no. 7); 1 m1 (no. 2); 1 m2 (no. 4); 1 m3 (no. 6); 3 M1 (no. 8–10); 4 M2 (no. 13–16); 1 M3 (no. 17).

Eggingen-Mittelhart 2: (SMNS 44721): 2 m2 (no. A A1, A2); 5 m3 (no. A A4, A5, B1–B3); 2 P4 (no. A A6–A7); 1 M3 (no. AB7).

(SMNS 44722): 1 M2 (no. E7); 1 M3 (no. G10).

Measurements: The measurements are listed in table 1. The measurements of *P.micheli* from Coderet are given for comparison.

Description

p4 (8). – The tooth is somewhat rectangular with a convex antero-labial side.

The protoconid has a triangular shape. The front is rounded, the back of the cone is straight. A small cuspule may be present on the postero-labial side of this face.

At the posterior end of the tooth a conspicuous talonid is present. On the lingual side of this talonid an entoconid is found. There is no hypoconid.

The parastylid is strongly developed and continues along the lingual side. On the labial side a weakly to moderately developed cingulum runs to the middle of the protoconid. The lingual cingulum is narrow and may be absent.

m1 (4). – The trigonid is short and high. The oblique cristid ends against the middle of the proto-metaconid crest. The entocristid, if present, is weak; a metacristid is absent. The entostylid is rather large.

The anterior and the posterior cingulum are strong. The re-entrant valley is small and is bordered by a labial cingulum.

m2 (10). – The trigonid is short and high. A clear entocristid is present; there is no metacristid. The parastylid is a mere widening of the anterior cingulum. From the parastylid runs a short lingual cingulum. The entostylid is well developed.

The anterior and posterior cingulum are strong to very strong. The re-entrant valley is rather narrow and is bordered by a labial cingulum.

m3 (20). – The trigonid of the m3 strongly resembles that of the m2.

The talonid is only slightly narrower than the trigonid. Hypoconid and entoconid are well developed. The oblique cristid ends against the middle of the proto-metaconid crest or somewhat lingually of this point. The entocristid is well developed, a metacristid is absent.

The anterior cingulum is strong. The parastylid is a widening of this cingulum. In a number of teeth a narrow posterior cingulum is present.

P4 (7). – The tooth has a somewhat triangular outline. The antero-lingual and postero-lingual borders are rather straight.

The paracone is very high. The posterocrista is S-shaped and sharp. Lingually of the tip of the paracone lies a very small protocone. In front of the paracone lies a small parastyle.

Tooth	Loc.	N	L		W	
			range	mean	range	mean
p4	E.-M. 1	8	1.11–1.33	1.23	0.69–0.81	0.75
	E.-M. 2	–		–		–
	Cod.	4	1.01–1.19	1.11	0.66–0.72	0.70
m1	E.-M. 1	5	1.78–1.88	1.84	1.19–1.28	1.24
	E.-M. 2	–		–		–
	Cod.	20	1.63–1.91	1.73	1.08–1.25	1.17
m2	E.-M. 1	10	1.68–2.01	1.89	1.10–1.34	1.22
	E.-M. 2	2	1.81–1.89	1.85	1.15–1.18	1.17
	Cod.	30	1.64–2.03	1.81	1.00–1.25	1.15
m3	E.-M. 1	17	1.44–1.76	1.60	0.75–0.97	0.89
	E.-M. 2	5	1.37–1.47	1.41	0.71–0.89	0.84
	Cod.	12	1.39–1.58	1.48	0.74–0.90	0.80
P4	E.-M. 1	3	1.50–1.54	1.52	1.13–1.19	1.17
	E.-M. 2	1		1.47		1.05
	Cod.	2	1.40–1.41	1.41	0.96–1.08	1.02
M1	E.-M. 1	5	2.28–2.50	2.38	1.41–1.68	1.58
	E.-M. 2	1		2.41		1.53
	Cod.	16	2.14–2.57	2.35	1.32–1.66	1.47
M2	E.-M. 1	5	1.72–1.96	1.84	2.05–2.10	2.07
	E.-M. 2	1		1.69		2.00
	Cod.	13	1.56–1.91	1.75	1.80–2.28	2.00
M3	E.-M. 1	10	0.88–1.08	0.99	1.32–1.62	1.53
	E.-M. 2	2	1.06–1.08	1.07	1.58–1.64	1.61
	Cod.	1		1.04		1.59

Tab. 1. Measurements of molars of *Paratalpa micheli* from Eggingen-Mittelhart. Measurements of *P. micheli* from Coderet have been added for comparison.

The tooth is surrounded by a narrow to well-developed cingulum, which is only interrupted at the antero-lingual side.

M1 (11). – The paracone is narrow. The posterior arm is S-shaped. The metacone is high, and its posterior arm is short for a talpid. The mesostyle is divided.

The protocone is large. The protoconule is absent, the hypocone is small and hardly isolated. The trigon basin is rather narrow.

The parastyle is well to strongly developed; the metastyle is small. The posterior cingulum is narrow to rather broad. At the back of the lingual side a short cingulum may be present.

M2 (10). – The mesostyle is more or less divided. The parastyle is connected to the anterior arm of the paracone. Parastyle and metastyle protrude.

The lingual outline of the teeth is rather pointed. The protocone is situated in the front part of the tooth which gives the crown a rather asymmetrical shape. A protoconule is not recognizable in our rather worn material. The hypocone is small and distinct.

The anterior cingulum runs from the middle of the paracone towards the parastyle, the posterior cingulum runs from the hypocone to the metastyle. Both cingula are narrow.

M3 (10). – The anterior arm of the paracone is long. The parastyle is hooked. In a number of teeth the parastyle is slightly isolated. The metacone is the same height as the paracone, its arm is S-shaped. The mesostyle is more or less divided.

The hypocone is isolated and placed far to the back of the tooth. A protoconule is not present.

A weak anterior cingulum runs from the middle of the paracone to the parastyle.

Discussion

The combination of upper molars having a divided mesostyle and a strongly reduced protoconule, and lower molars having an oblique cristid ending at the middle of the proto-metaconid crest is found in three genera. These are *Teutonotalpa*, *Paratalpa* and *Desmanodon*. Before discussing the species from Eggingen-Mittelhart we review these three genera and the differences between them.

Teutonotalpa, *Paratalpa* and *Desmanodon*

Teutonotalpa (type species *T. meyeri*) is described by HUTCHISON (1974). His description was based on the holotype only (a block of matrix containing associated fragments of the upper and lower jaw from one individual). *Teutonotalpa* is not known from any other locality, so the humerus is not known.

Paratalpa is also a monospecific genus. *P. micheli* was described from Cournon by LAVOCAT (1951). Only lower molars are known from the type locality. A large collection of *P. micheli*, including the upper molars of the species, was described by HUGUENEY (1974) from Coderet. She noted the presence of humeri referable to *P. micheli* in Coderet, but neither described nor figured these. Later the humerus of *Paratalpa* was figured by ENGESSER (1980, from Coderet) and BRUNET et al. (1985, from Cournon-les-Soumeroux). However, it remains undescribed.

HUGUENEY noted the presence of *Paratalpa* in a number of Upper Oligocene/Lower Miocene localities, including a small collection labelled „Ulm, 1913". This collection possibly contains material from the localities Haslach and Eggingen (HUGUENEY, 1974, p. 42). The assemblage from Saulcet was placed in a separate subspecies, *P. m. saulcetensis*. The collection from Saulcet of the Basel Museum contains humeri identical to those from Coderet which are referred to *P. micheli*.

The association of molars and humeri seems to be certain for *P. micheli*. They have not only been found together in Coderet and Saulcet, but also in Cournon-les-Soumeroux, a locality very close to the type locality of the species (BRUNET et al., 1985).

Among the genera discussed here *Desmanodon* is the only genus which contains more than one species. ENGESSER (1980) defined this genus and described two species from Turkish localities. These are *D. minor* from Sarı Çay and *D. major* from Eskihisar. (*Desmanondon* sp. from Sarı Çay (ENGESSER, 1980) should be referred to *Myxomygale*.) He referred two elements from Paşalar to *D.* cf. *minor* (op. cit.).

DOUKAS (1985) described a species of *Desmanodon*, *D. meuleni* from Aliveri (Greece). ZIEGLER (1985) described *D. antiquus* from Rauscheröd and Rembach. In a later article (ZIEGLER & FAHLBUSCH, 1986) the presence of this species in Forsthart was mentioned. DOUKAS suggested that *D. antiquus* might be a junior synonym of *D. meuleni*.

Forsthart, Rauscheröd and Rembach are localities in the „Limnische Süsswasserschichten" of Lower Bavaria (F.R.G.). All of them have been dated as uppermost

Middle „Orleanian" (MN 4b) (ZIEGLER & FAHLBUSCH, 1986). Petersbuch 2 and Erkertshofen 2, two Bavarian fissure fillings of a similar age have yielded a Talpini gen. et sp. indet. (ZIEGLER, 1985). The lower elements of this species agree in size and morphology very well with *D. antiquus,* as do the M2 from Erkertshofen 2 (the M2 from Petersbuch 2 (op. cit. pl. 6, fig. 5) clearly belongs to another species). The P4 has not been seen, but agrees in size with the P4 from Rauscheröd. All of these elements are here referred to *D. antiquus.*

The other elements of Talpini gen. et sp. indet. can be placed as well. The M3 is similar to those of *„Talpa"* sp. 1 (ZIEGLER, 1985, p. 154), whereas the M2 from Petersbuch 2 and all of the M1 can be placed in *„Talpa"* sp. 2 (op. cit., p. 156), of which no upper molars have been found hitherto. The humeri of the species seem to be too small to be placed in either *„Talpa"* 1 or 2, and remain unidentified.

Since *D.major* is the only non-urolopsine mole found in Eskihisar, the association of molars and humeri seems to be certain. Humeri of *Desmanodon* are known from the Turkish localities and from all of the South German localities. No humeri have been found in Aliveri.

The Eskihisar material has not been re-measured. Some alterations have been made in the classifications from Aliveri. The m1 originally referred to *D. meuleni* is now placed in *Myxomygale engesseri,* whereas the M1 referred to *Myxomygale* falls in the variation of *D. meuleni.* I found an unpublished P4 referable to *Desmanodon* in the Aliveri collection. From Forsthart eight elements (1 m1, 2 m2, 1 m3 and 3 M3) could be studied which were collected after ZIEGLER finished his paper.

Differences between *Teutonotalpa, Paratalpa* and *Desmanodon*

ENGESSER (1980) noted the close resemblance of *Desmanodon* to *Paratalpa* and *Teutonotalpa.* He gave differential diagnoses for the genera. The differences between *Desmanodon* and *Teutonotalpa* are:

a. the stronger development of the hypocone of the upper molars
b. the absence of a postero-lingual conule on the p4
c. the absence of a lingual cingulum at the p4 and p3
d. the P4 with a much longer paracone and better developed protocone
e. the absence of a clear parastyle at the P4.

The differences between *Desmanodon* and *Paratalpa* are:

f. the more specialised humerus
g. the strong reduction of the p2 instead of the p3
h. the weaker development of the protoconule of the upper molars
i. the stronger development of the hypocone of the upper molars
j. the strongly developed protocone of the P4.

Practically all of these differences have been invalidated by the description of *D. meuleni* and *D. antiquus.* Both of these species have a more weakly developed hypocone than the Turkish species (a, i), and *D. meuleni* shows a stronger development of the protoconule (h). The p4 of *D. antiquus* shows a cuspule at the postero-lingual border of the protoconid (b).

Of the six remaining differences three are concerned with the P4. In examining the material of *Desmanodon* I found three morphotypes of P4 in the genus (fig. 2). The

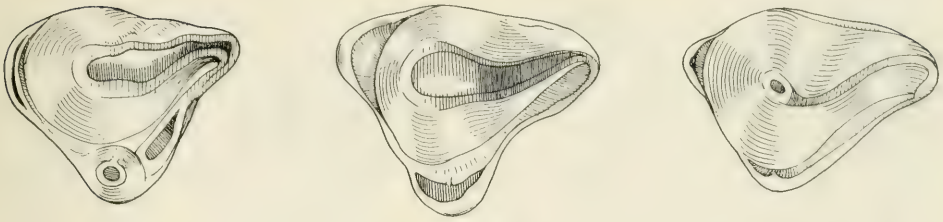

Fig. 2. The various morphotypes of P4 found in *Desmanodon* and *Paratalpa*. a: type A, b: type B, c: type C (see text).

P4 from Aliveri and the Turkish localities have a very small parastyle, a well-developed protocone and a straight posterocrista (type A). Those from Forsthart and Rembach have a well-developed parastyle and protocone, and a rather straight posterocrista (type B), whereas the P4 from Rauscheröd have both a small parastyle and protocone, and a clearly S-shaped posterocrista (type C).

Type C is also found in *Teutonotalpa* and *Paratalpa* from Coderet. The type B P4 is very similar to the P4 found in *Paratalpa micheli saulcetensis* (Hugueney, 1974, textfig. 26). Therefore differences in the morphology of the P4 cannot be used to distinguish the genera. Although the morphotypes are not restricted to one species, it is notable that in none of the assemblages studied more than one morphotype is present.

The reduction of the p2 instead of the p3 (g) is something which can only be seen in *D. minor*. In *D. major* the p3 seems to be reduced. Reduction of the p3 can also be seen in the lower jaw from Petersbuch 2 which should be referred to *D. antiquus* (see above). Therefore this character might well be confined to just one species of *Desmanodon*. Therefore none of the odontological characters used by Engesser to separate *Desmanodon* from *Paratalpa* remains. The only remaining character to separate *Desmanodon* from *Teutonotalpa* is the lingual cingulum along the premolars of the latter genus. In the Eggingen-Mittelhart species the lingual cingulum is present in only a number of the p4. This character can therefore not be used taxonomically.

I found no further differences between the dentitions of the three genera. The teeth form a morphocline which shows an increase in size (fig. 3 and 4), a reduction of the protoconule, a widening of the mesostyle, and an increase in size of the hypocone.

Although no division can be made on the basis of tooth morphology, the difference between the humeri of *Desmanodon* and *Paratalpa* (fig. 5) makes distinction of the two genera necessary. The humerus of *Desmanodon* with its long tuberculum teres is clearly of a different type than the humerus of *Paratalpa*, although it is theoretically derivable from the latter.

Since the humerus of *Teutonotalpa* is not known it is impossible to distinguish this genus from either *Desmanodon* or *Paratalpa*.

The species from Eggingen-Mittelhart

The identification of the species from Eggingen-Mittelhart is hampered because the humerus is not known. In size and dental morphology it is close to *Teutonotalpa meyeri, Desmanodon antiquus* and *Paratalpa micheli* (see fig. 3 and 4).

Fig. 3. Width/length diagram of the m2 of various species of *Paratalpa* and *Desmanodon*. Dots = *Paratalpa micheli* from Coderet, crosses = *P. micheli* or *Desmanodon antiquus* from Eggingen-Mittelhart, starlet = *D. antiquus* from Rauscheröd, closed squares = *D. antiquus* from Forsthart, open squares = *D. minor* from Sarı Çay.

Fig. 4. Width/length diagram of the M2 of different species of *Paratalpa* and *Desmanodon*. Symbols as fig. 3 except for circles = *D. meuleni* from Aliveri.

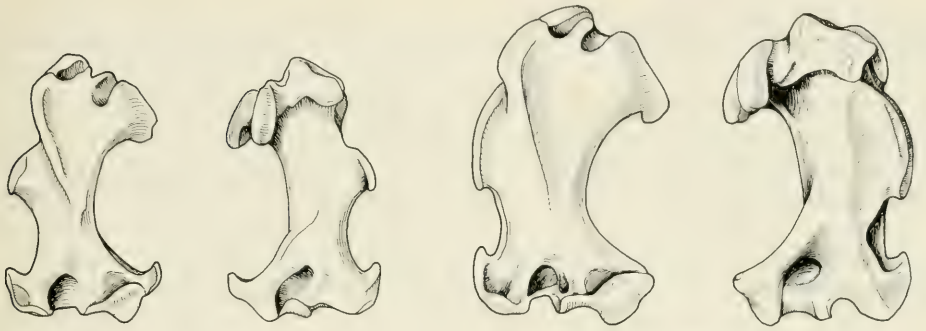

Fig. 5. The humerus of *Desmanodon* (a: *D. major* from Eskihisar) and *Paratalpa* (b: *P. micheli* from Coderet).

The type of *T. meyeri* falls within the size range and morphological variation of the Eggingen-Mittelhart material. It differs only in one detail. The p4 from the type bear a very weak posterocristid, which is not found in any of the p4 from Eggingen-Mittelhart.

The material from Rembach and Forsthart (*Desmanodon antiquus*) falls in the upper part from the size range of the Eggingen-Mittelhart material. The few elements from Rauscheröd fall in the middle of the size range. In the degree of protoconule and hypocone development our material agrees very well with *D. antiquus.*

Paratalpa micheli from Coderet seems in some respects a bit more primitive than the Eggingen-Mittelhart assemblage. In a number of m2 the oblique cristid ends clearly on the lingual side of the middle of the proto-metaconid crest and some M2 have a small protoconule. Metrically, however, the two assemblages agree very well.

Given the close resemblance of the Eggingen-Mittelhart assemblage with respect to both *P. micheli* and *D. antiquus* the material could be placed in either species. Without the humerus no decision can be made. Since the type of *Teutonotalpa meyeri* material falls completely within the variation of our material, this name should be regarded as a junior synonym of *Paratalpa micheli.*

The evolution of the group

Since the teeth of *Paratalpa* and *Desmanodon* form a continuous morphocline our working hypothesis is that *Desmanodon* descends from *Paratalpa.* The occurrence of the P4 morphotypes A and B in both genera is a strong indication that the two genera form one evolutionary lineage.

The change from *Paratalpa* to *Desmanodon* lies in the development of the *Desmanodon* type of humerus. Figure 6 shows that the finds of humeri are separated in time.

Although the humerus of both *Paratalpa* and *Desmanodon* is essentially poorly adapted for a burrowing mode of life, the *Desmanodon* humerus is clearly more specialised. A possible reason for moving towards a more burrowing way of life is competition with another group of non-burrowing moles, the Urolopsinae.

In Eggingen-Mittelhart we find the oldest representative of the Urolopsinae together with *Paratalpa. Desmanella* sp. is, however, represented by two teeth only.

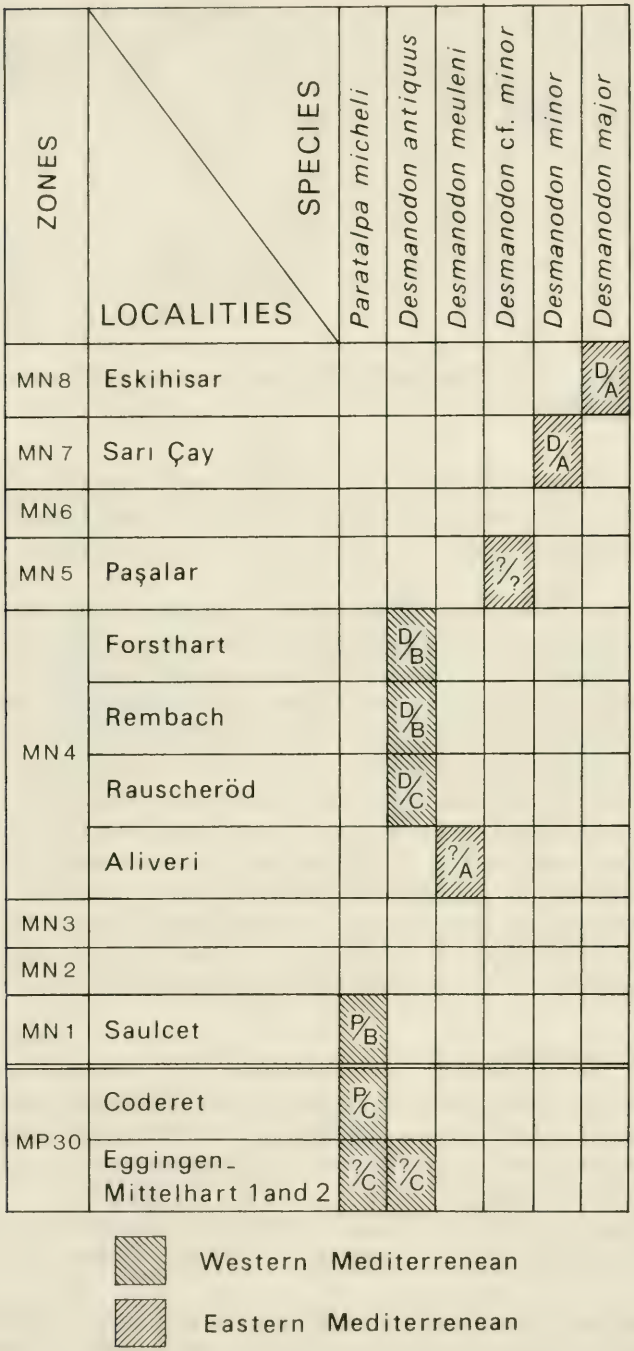

Fig. 6. Range chart of the species of *Paratalpa* and *Desmanodon* known from literature. The letters in brackets give the type of humerus (P = *Paratalpa*, D = *Desmanodon*) and the type of P4 (see fig. 2) respectively.

The South German MN 4 localities, from which *Desmanodon* humeri are known, *Desmanella (D. engesseri)* is an important part of the talpid fauna (Ziegler, 1985, Ziegler & Fahlbusch, 1986).

The material from Aliveri is difficult to identify, because the humerus is not known. In dental characters the Aliveri assemblage is very primitive. The size of the elements is very small (see fig. 4), the hypocone is relatively poorly developed and in a number of M2 a protoconule is present. (*Desmanodon meuleni* is certainly not conspecific with *D. antiquus*.)

The morphotype of the P4 suggests that the species belongs to the *D. minor* – *D. major* lineage. This lineage seems to represent the south-east european branch of *Desmanodon*.

Genus *Myxomygale* Filhol, 1890

Myxomygale cf. *engesseri* Doukas, 1985

Pl. 1, figs. 3–5

Material: Eggingen-Mittelhart 1: (SMNS 44482): 2 p4 (no. A17, B17), 1 M1 (no. J17), 1 M2 (no. L17).
Eggingen-Mittelhart 2: (SMNS 44721): 1 m3 (no. A B4).
Measurements: see table 2.

Description

Eggingen-Mittelhart 1

p4 (2). – The tooth has a somewhat rectangular outline. The labial side is convex, the lingual side straight.

The protoconid is very high. The front face of the cone is rounded, the back face is concave. The posterolingual face is bordered by a small crest.

At the back of the tooth a talonid is present. The lingual side of the talonid is much higher than the labial side. At the posterior end of the talonid a small entoconid is present.

In front of the paraconid lies a large parastylid. Along the lingual side of the tooth runs a clear cingulum. At the labial side a cingulum runs from the middle of the protoconid to the parastylid.

M1 (1). – The labial part of the single tooth found is rather damaged. Para- and metastyle are broken off. The mesostyle is damaged but appears to have been undivided.

Tooth	Loc.	N	L		W	
			range	mean	range	mean
p4	E.-M. 1	2	0.82–0.94	0.88	0.46–0.47	0.47
	E.-M. 2	–		–		–
m3	E.-M. 1	–		–		–
	E.-M. 2	1		–		–
M2	E.-M. 1	1		1.32		1.53
	E.-M. 2	–		–		–

Tab. 2. Measurements of *Myxomygale* cf. *engesseri* from Eggingen-Mittelhart.

The lingual side is very broad. Protoconule and hypocone are small and not isolated. The lingual cones are clearly seperated from the labial cones by a broad valley.

Along the metacone runs a broad posterior cingulum.

M2 (1). – The posterior arm of the metacone is slightly elongated, thus giving the tooth a somewhat asymmetrical outline. The mesostyle is undivided. Para- and metastyle are very small and connected to the paracone and metacone respectively.

The lingual outline of the tooth is rounded. Protoconule and hypocone are small but distinct. The trigon basin is broad.

No cingula are present.

Eggingen-Mittelhart 2

m3 (1). – The talonid is only slightly more narrow than the trigonid. The oblique cristid ends against the metaconid. A very weak meta- and entoconid are present.

The anterior cingulum is well developed. A parastylid is not discernable. The reentrant valley is bordered by a labial cingulum.

Discussion

The M2 described above is slightly smaller than those of *Myxomygale engesseri* (Doukas, 1985), but has the same morphology. Unfortunately the two assemblages do not have any other elements in common. Since no extensive comparison can be made, the species is classified as *Myxomygale* cf. *engesserie.*

For a long time *Myxomygale* was only known from the Middle Oligocene of the Quercy. The occurrence of this genus in Aliveri (Aragonian) was rather surprising. The presence of *Myxomygale* in Eggingen-Mittelhart closes the large timespan between the species of *Myxomygale* from the Quercy and Aliveri.

Ziegler (1985) described a new genus, *Palurotrichus,* from several MN 4 localities in S. Germany. This genus agrees very well with *Myxomygale.* The resemblence in dental morphology was already noted by Doukas (1985). Furthermore, both genera have one-rooted p1–p3, and a somewhat enlarged alveole for the c (Ziegler, 1985, Filhol, 1890).

I was able to compare the collections of *P. hutchisoni,* the only known species of *Palurotrichus,* directly with the Aliveri material. *P. hutchisoni* is somewhat larger than *M. engesseri,* has a better developed lingual part of the P4, and a more rounded lingual outline of the M2. In all other characters the two species are very much alike. Indeed, the m2 and M3 of the two species cannot be distinguished.

The close resemblence of *M. engesseri* and *P. hutchisoni* warrants them to be placed in one genus. Since the genus name *Myxomygale* has priority, I consider *Palurotrichus* as a junior synonym of *Myxomygale.*

Genus *Geotrypus* Pomel, 1848

Geotrypus sp.

Pl. 4, figs. 1–4

Material: Eggingen-Mittelhart 1: (SMNS 44482): 1 m2 (no. D1); 1 m3 (no. F1); 2 M2 (no. K1, L1); 2 M3 (no. M1, N1).

Measurements: See table 3.

Tooth	N	L		W	
		range	mean	range	mean
m2	1		2.66		1.57
m3	1		2.12		0.90
M3	2	2.07–2.09	2.08	1.41–1.50	1.46

Tab. 3. Measurements of *Geotrypus* sp. from Eggingen-Mittelhart 1.

Description

m2 (1). – The tooth is damaged. The oblique cristid ends against the labial side of the metaconid. Meta- and entocristid are absent. The parastylid is a widening of the anterior cingulum. The entostylid has been broken off, but appears to have been large.

The anterior cingulum is broad. No further cingula are present. The re-entrant valley is wide.

m3 (1). – The tooth is very worn. The trigonid appears to have been short and high. The oblique cristid ends against the labial side of the metaconid. A weak entocristid is present, a metacristid ist absent.

The parastylid is small. There are no cingula.

M2 (2). – Both M2 available are severly damaged. The metacone is much larger than the paracone. The parastyle is connected to the anterior arm of the paracone. The mesostyle seems to have been undivided, or at the most slightly divided.

The lingual part of the tooth is pointed. Protoconule and hypocone are absent. There seem to be no cingula.

M3 (2). – The anterior arm of the paracone is somewhat elongated. The parastyle is connected to this arm. The mesostyle is hardly divided.

The lingual part is pointed. The protocone is clearly separated from the labial cones. The protoconule and hypocone are absent. There are no cingula.

Discussion

Our teeth are larger than those of any other representative of *Geotrypus*. Two relatively large species of *Geotrypus* are known, *G. arambourgi* from Cournon (Lavocat, 1951) and *Geotrypus* sp. from Coderet (Hugueney, 1972). Unfortunately we cannot compare the species from Eggingen-Mittelhart 1 with either of these, as the assemblages do not have any element in common.

It is noteworthy that a large talpid humerus is known from Tomerdingen near Ulm which has been described as *„Talpa tomerdingensis"* (Tobien, 1939). According to Hutchison (1974) this humerus should be allocated to *Geotrypus*.

Genus *Hugueneya* n.g.

Type species: *Hugueneya primitiva* (Hutchison).

Derivatio nominis: The genus is named in honor of Mrs. Hugueney (Lyon), for her excellent work on the talpid fauna of Coderet.

Diagnosis. – Moderate to large sized mole. The p1 is much smaller than the p4, but larger than the subequal p2–p3. The p1–p3 bear a single, blunt cusp. Lower molars with bulbous cusps; the oblique cristid ends against the labial side of the metaconid, the entocristid is–very–strongly developed.

The protocone of the P4 is strongly reduced. Upper molars with clearly divided mesostyles. The protoconule is strongly reduced, the hypocone is indistinct.

Hugueneya primitiva (HUTCHISON 1974)
Pl. 2, figs. 5–6; pl. 3, figs. 1–5

*1974 *Proscapanus primitivus*. – HUTCHISON, p. 229–232.
Holotype: Right mandible carrying 2 i, p1–p3, m1–m3 (BSP 1881 IX 523).
Type locality: „Classical Eggingen" (formerly „Eckingen").
Age of type locality: U. Oligocene/L. Miocene.

Diagnosis. – See genus.

Description of the holotype: The mandible is encased in the matrix, so the labial side cannot be seen. The processus coronoides is damaged, the processus angularis is incomplete.

Two incisiform elements are present in front of the p1. One of these is clearly larger than the other. Since the anterior part of the mandible is slightly damaged, it is impossible to say whether or not these elements lie in their original position, or whether more elements have been present.

The p1–p4 are double-rooted (p4 is represented by alveoles only). The first three premolars bear a single, blunt cusp, and have poorly developed cingula. The p1 is larger than the subequal p2–p3. The p4 seems to have been the largest of the premolars.

The molars entirely agree with the material from Eggingen-Mittelhart (see descriptions below). They have a rectangular outline and rather bulbous cones. The oblique cristid ends in all three molars against the labial side of the metaconid. A strong entocristid is present; the molars bear no metacristid. The re-entrant valley is bordered by a labial cingulum.

Material: Eggingen-Mittelhart 1: (SNMS 44482): 1 p4 (no. A1); 3 m1 (no. C3–C5); 2 m2 (no. D3, D4); 1 m3 (no. E3); 4 M2 (no. K3–K4, L3–L4); 12 M3 (no. M3–M7, N3–N9); (BSP 1983 XXII): 1 m1 (no. 1); 1 m2 (no. 3).
Eggingen-Mittelhart 2: (SNMS 44722): 5 p4 (no. A1–A4, B5); 1 m1 (no. C1); 3 m2 (no. D1, D3, E1); 1 m3 (no. G1); 4 P4 (no. A5–A8); 2 M2 (no. D5, E5); 2 M3 (no. F5, F6).
Measurements: The measurements are listed in table 4.

Tooth	Loc.	N	L		W	
			range	mean	range	mean
p4	E.-M. 1	1		1.83		1.00
	E.-M. 2	5	1.63–1.76	1.70	0.90–1.00	0.95
m1	E.-M. 1	2	2.14–2.28	2.21	1.46–1.46	1.46
	E.-M. 2	1		1.31		1.48
m2	E.-M. 1	3	2.15–2.34	2.23	1.36–1.43	1.40
	E.-M. 2	3	2.15–2.37	2.29	1.34–1.39	1.37
m3	E.-M. 1	1		1.91		1.01
	E.-M. 2	1		1.85		0.93
P4	E.-M. 1	–		–	–	
	E.-M. 2	1		2.13		1.58
M2	E.-M. 1	3	1.86–1.97	1.93	2.26–2.32	2.28
	E.-M. 2	2	1.96–2.01	1.99	2.12–2.18	2.15
M3	E.-M. 1	12	1.12–1.28	1.21	1.69–1.93	1.78
	E.-M. 2	3	1.10–1.37	1.26	1.75–1.92	1.85

Tab. 4. Measurements of *Hugueneya primitiva* from Eggingen-Mittelhart.

Description

Eggingen-Mittelhart 1

p4 (1). – The tooth is long and slender. The protoconid is very large. At the back of the tooth a small talonid is present. At the lingual side of the talonid lies a entoconid. In front of the protoconid a small parastylid is present. There are no cingula.

m1 (3). – The tooth has a rectangular outline and rather bulbous cones. The trigonid is relatively broad. The oblique cristid ends somewhat labial from the metaconid. The entocristid is well developed, a metacristid is absent.

The parastylid is small, the entostylid large. The anterior and posterior cingula are broad. The re-entrant valley is small and is bordered by a labial cingulum.

m2 (2). – The tooth has a rectangular outline and rather bulbous cones. The oblique cristid ends somewhat labial from the metaconid. The entocristid is strongly developed, a metacristid is absent.

The parastylid is a widening of the anterior cingulum, the entostylid is large. The anterior and posterior cingula are very broad. The re-entrant valley is small and is bordered by a labial cingulum.

m3 (1). – The trigonid of the m3 strongly resembles that of the m2. Hypo- and entoconid are well developed. The oblique cristid ends somewhat labial of the metaconid. A metacristid is absent, the entocristid is well developed.

The anterior cingulum is broad. The parastylid is formed by a widening of this cingulum. From the parastylid a short cingulum runs along the lingual side. The re-entrant valley is rather small.

M2 (8). – The labial cones are very symmetrical. The para- and metastyle are connected to the paracone and metacone respectively. The mesostyle is clearly divided.

The lingual side of the tooth is rather pointed. The protocone is large. The protoconule is strongly reduced; the hypocone is a small, poorly isolated cone.

The anterior cingulum runs from the middle of the paracone to the parastyle. The posterior cingulum runs along the metacone. Both cingula are short. Small cingular patches lie along the lingual side of the tooth.

M3 (12). – The paracone is rather symmetrical. The anterior arm forms a small parastyle. The mesostyle is clearly divided.

The protocone is large. There is no protoconule present. The hypocone is isolated, and lies far to the back of the tooth. Because of this the tooth has a rather straight posterior border.

In a number of teeth a weak anterior cingulum is present.

Eggingen-Mittelhart 2

p4 (5). – The tooth has a somewhat rectangular outline. The labial border is rather convex, the lingual side is very straight.

The lingual face of the protoconid is flat. The anterior and posterior borders of this face are rather sharp. The antero-labial side of the protoconid is very rounded.

The posterior side of the tooth consists of a small, shallow talonid, on which a low entoconid is placed. A short, narrow anterior cingulum is present.

m1 (1), m2 (3), m3 (1). – These elements agree with those found in Eggingen-Mittelhart 1.

P4 (4). – The tooth bears only one cone, the paracone. The posterocrista is straight. The paracone is surrounded by a clear, uninterrupted cingulum. This cingulum may bear a very small cuspule in front of the paracone, the parastyle. A protocone is not present.

M2 (2).– The two M2 have a widely spaced mesostyle. The hypocone is incorporated in the posterior arm of the protocone. In all the other characters they resemble the M2 of Eggingen-Mittelhart 1.

M3 (2). – The two M3 fall completely in the variation found in Eggingen-Mittelhart 1.

Discussion

Since *Hugueneya primitiva* and *Paratalpa micheli/Desmanodon antiquus* are of approximately the same size, and since both species lack a protoconule, the distinction of the upper molars provides some difficulties. This problem does not occur for the other elements. The lower molars, p4 and P4 show very clear morphological differences. The very large p4 was first believed to belong to *Geotrypus* sp. However, 5 p4 of this type have been found in Eggingen-Mittelhart 2. *Geotrypus* is not known from this locality, whereas *Hugueneya* is represented by a large number of elements.

In Eggingen-Mittelhart 1 and 2 the overall variation of the upper molars of moderate size talpids is too large to place all elements in one species, so that it is clear that elements of both *H. primitiva* and *P. micheli/D. antiquus* are present.

A number of the M3 has an anterior arm of the paracone of approximately the same length as the posterior arm, whereas in others the anterior arm is elongated. Those M3 in which the arm is not elongated have a clearly separated mesostyle. The mesostyle in the other M3 is more or less divided. In a width/length diagram (fig. 7) we can see that this division into two groups results in clear-cut clusters. Since the lower molars of *H.primitiva* are larger than those of *P.micheli/D.antiquus,* the larger M3 are referred to the first species.

As in the M3, the division of the mesostyle has been used to make a first grouping in the M2. Those molars with a clearly divided mesostyle generally have a less distinct hypocone and a very large protocone. Again we can see that clusters are formed in the width/length diagram (fig. 8), although less apparent as in the M3. Again the larger elements are placed in *Hugueneya.*

Distinguishing the M1 of the two species is very difficult. The M1 is the most variable element in talpids. This makes it very hard to recognize the interspecific from the intraspecific variation. Furthermore, since most of the M1 from Eggingen-Mittelhart have been damaged it is not possible to see whether a certain morphology is correlated with size.

Four of the M1 from Eggingen-Mittelhart 1 (SMNS 44482, I7, I9, J7, J9) have a clearly divided mesostyle comparable to that of the M2 of *Hugueneya primitiva.* The degree of division of the mesostyle in the other M1 varies considerably. Since the M1 cannot be separated with any certainty, all of them have been classified as *Paratalpa micheli/D. antiquus.* Some of these, and in particular those with a clearly divided mesostyle, may belong to *H. primitiva.*

The species was originally described as *Proscapanus primitivus* by Hutchison (1974). His description was based on two lower dentitions from the Schlosser collection (BSP 1881 IX 522, 523). One of these mandibles (523, the holotype) is labelled Eggingen, the other Eselsberg. To this species Hutchison allocated a

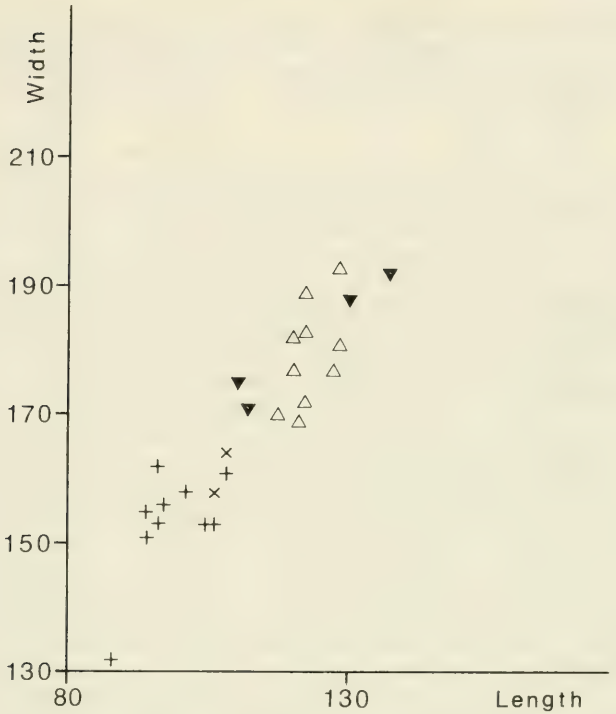

Fig. 7. Width/length diagram of the M3 of the moderate sized moles of Eggingen-Mittelhart (E.-M.) Crosses = *Paratalpa micheli* E.-M.1, diagonal crosses = idem E.-M.2, open triangles = *Hugueneya primitiva* E.-M.1, closed triangles = idem E.-M.2.

humerus and a metacarpale II from Eggingen, and 25 mostly fragmentary humeri from Haslach.

In his description of the holotype Hutchison stated that the mandible is lacking i3, c and p4, but that alveoli indicate the position of the missing teeth. The two incisiform elements were interpreted as i1 and i2.

Since the part of the jaw anterior to the p1 is slightly damaged, Hutchison's interpretation is subjective. Between the smaller of the „incisors" and the p1 I found only one alveole. This seems to have been that of the larger incisiform element. It cannot be decided whether or not more elements have been present, and it seems uncertain that the two elements found are in their original position. Therefore one of the grounds Hutchison had for allocating the species in *Proscapanus* – or at least in the scalopine moles –, the enlarged i1, is invalid. Another ground Hutchison had for placing this species in *Proscapanus* was the presence of a humerus of a burrowing type of mole in the classical Eggingen (BSP 1881 IX 524). On the humerus he writes (p. 230): „The humerus of the type locality cannot be directly associated with the jaw referred to *P. primitivus* (i.e. no articulations), but size and theoretical stage of evolution are in agreement." Such a basis for associating humeri and dentitions is, particularly in view of the limited material, flimsy. Furthermore, I found in the Coderet collection of the Naturhistorischen Museum Basel humeri similar to the Eggingen humerus. The only burrowing type of mole found in Coderet is *Geotrypus*. A species of *Geotrypus* is found in Eggingen-Mittelhart 1.

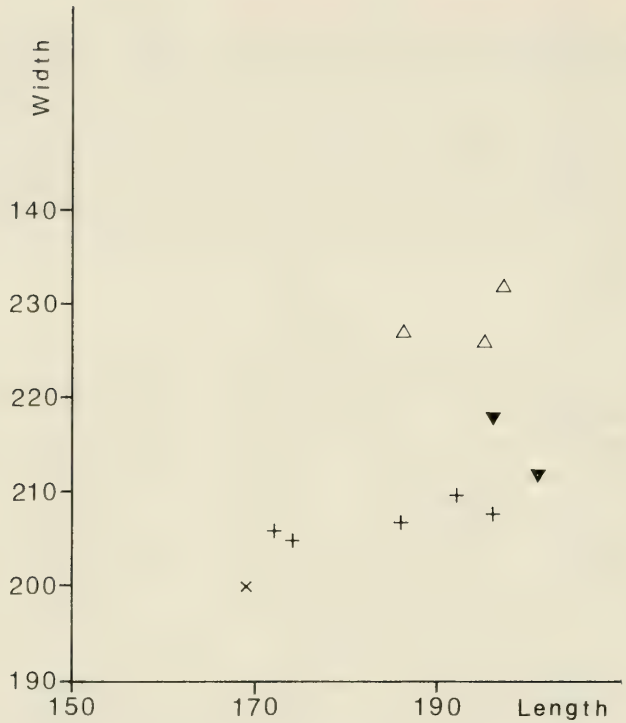

Fig. 8. Width/length diagram of the M2 of the moderate sized moles of Eggingen-Mittelhart. Symbols as in fig. 7.

In dental morphology the Eggingen species differs clearly from *Proscapanus*. It shares with this genus the slightly enlarged p1, the double rooted lower premolars (only in *P. intercedens*) and the typical P4 with the strongly reduced protocone. The lower molars, however, are rather bulbous, whereas the lower molars of *Proscapanus* are very slender.

The differences are even more apparent in the upper molars. The mesostyle is clearly divided and protoconule is practically absent. *P. intercedens*, the oldest species of *Proscapanus*, has a poorly divided mesostyle and a protoconule is present. These differences are too large to allow placing the Eggingen species in *Proscapanus*.

The species cannot suitably be placed in any other known genus either. Therefore the new genus *Hugueneya* has been erected.

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Plate 1

Desmanella sp. A, Eggingen-Mittelhart 2

Fig. 1.	m1 sin.,	SMNS 44721 B.
Fig. 2.	M2 dext.,	SMNS 44721 AB5.

Myxomygale cf. *engesseri* Doukas, 1983, Eggingen-Mittelhart 1

Fig. 3.	p4 sin.,	SMNS 44482 A17.
Fig. 4.	M1 dext.,	SMNS 44482 J17.
Fig. 5.	M2 dext.,	SMNS 44482 L17.

Paratalpa micheli Lavocat, 1951 or *Desmanodon antiquus* Ziegler, 1985, Eggingen-Mittelhart 1

Fig. 6.	p4 sin.,	SMNS 44482 A11.
Fig. 7.	m1 sin.,	SMNS 44482 C12.
Fig. 8.	m2 sin.,	SMNS 44482 C7.
Fig. 9.	m3 sin.,	SMNS 44482 E10.

All figures x 25.

Plate 1

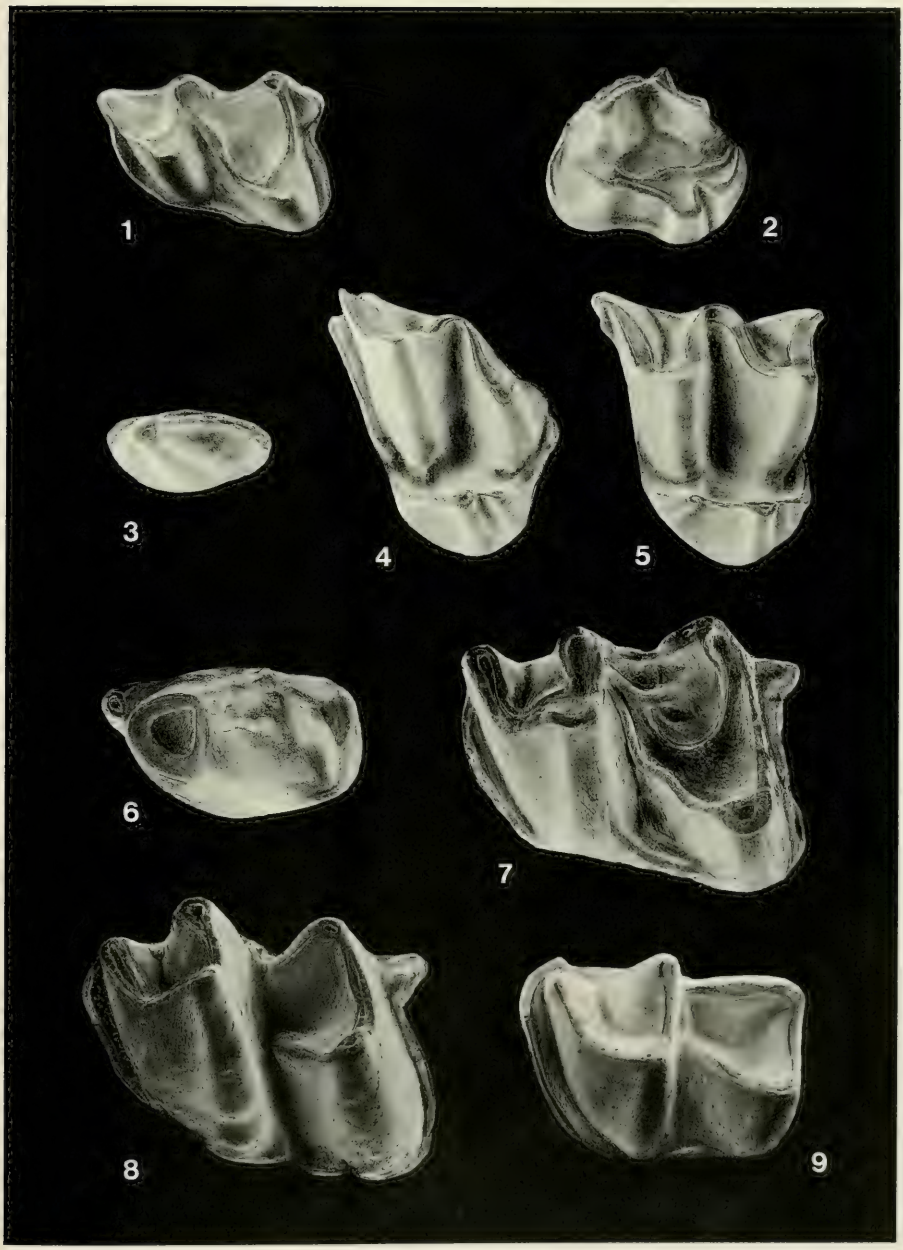


Plate 2

Paratalpa micheli LAVOCAT, 1951 or *Desmanodon antiquus* ZIEGLER, 1985, Eggingen-Mittelhart 1

Fig. 1.	P4 sin.,	SMNS 44482 G9.
Fig. 2.	M1 dext.,	SMNS 44482 J7.
Fig. 3.	M2 dext.,	SMNS 44482 L10.
Fig. 4.	M3 sin.,	SMNS 44482 M16.

Hugueneya primitiva (HUTCHISON, 1974), Eggingen-Mittelhart 1

Fig. 5.	M2 dext.,	SMNS 44482 L4.
Fig. 6.	M3 sin.,	SMNS 44482 M4.

All figures x 25.

Plate 2

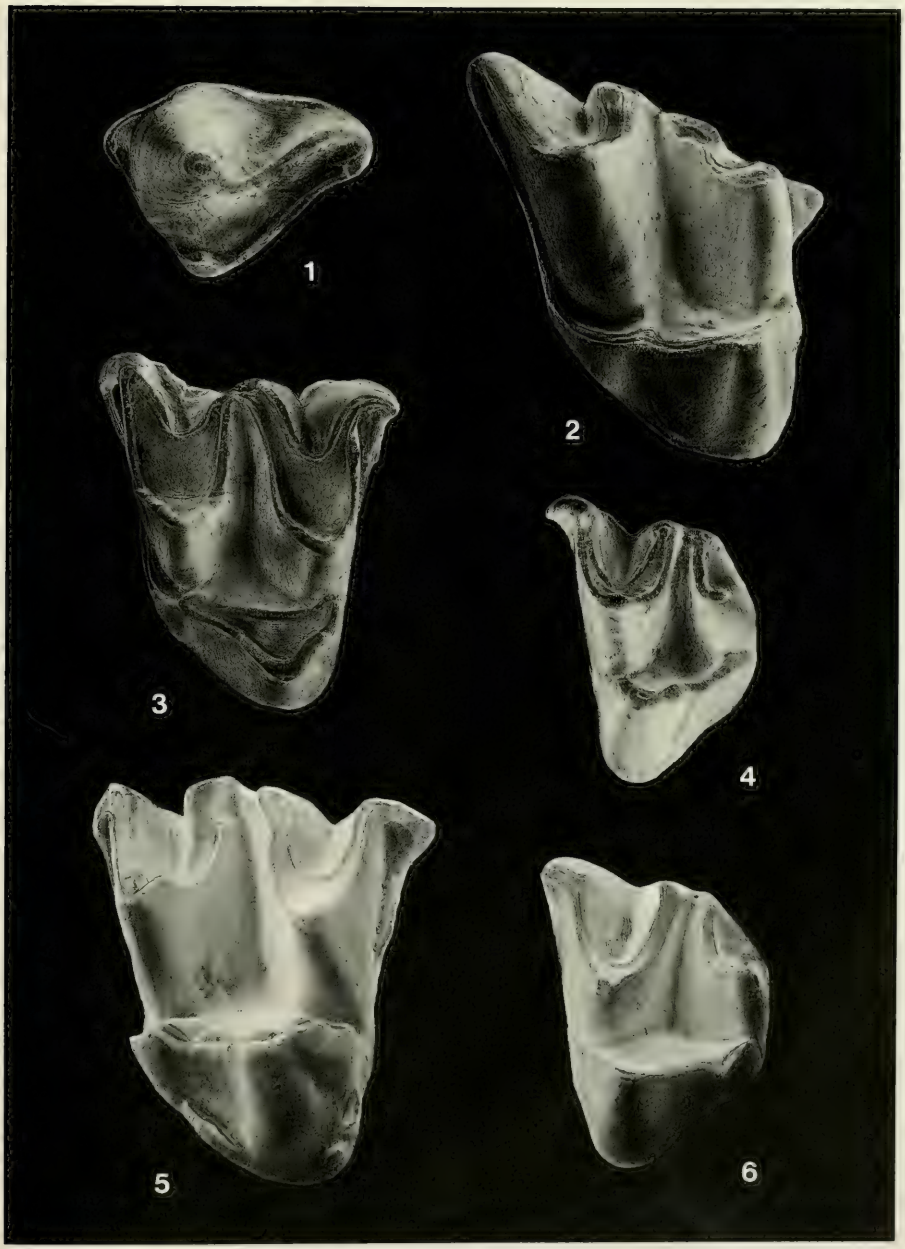


Plate 3

Hugueneya primitiva (HUTCHISON, 1974), Eggingen-Mittelhart 1

Fig. 1.	p4 sin.,	SMNS 44482 A1.
Fig. 2.	m1 dext.,	SMNS 44482 C4.
Fig. 3.	m2 sin.,	SMNS 44482 D3.
Fig. 4.	m3 sin.,	SMNS 44482 E3.

Hugueneya primitiva (HUTCHISON, 1974), Eggingen-Mittelhart 2

Fig. 5.	P4 dext.,	SMNS 44722 A7.

All figures x 25.

Plate 3

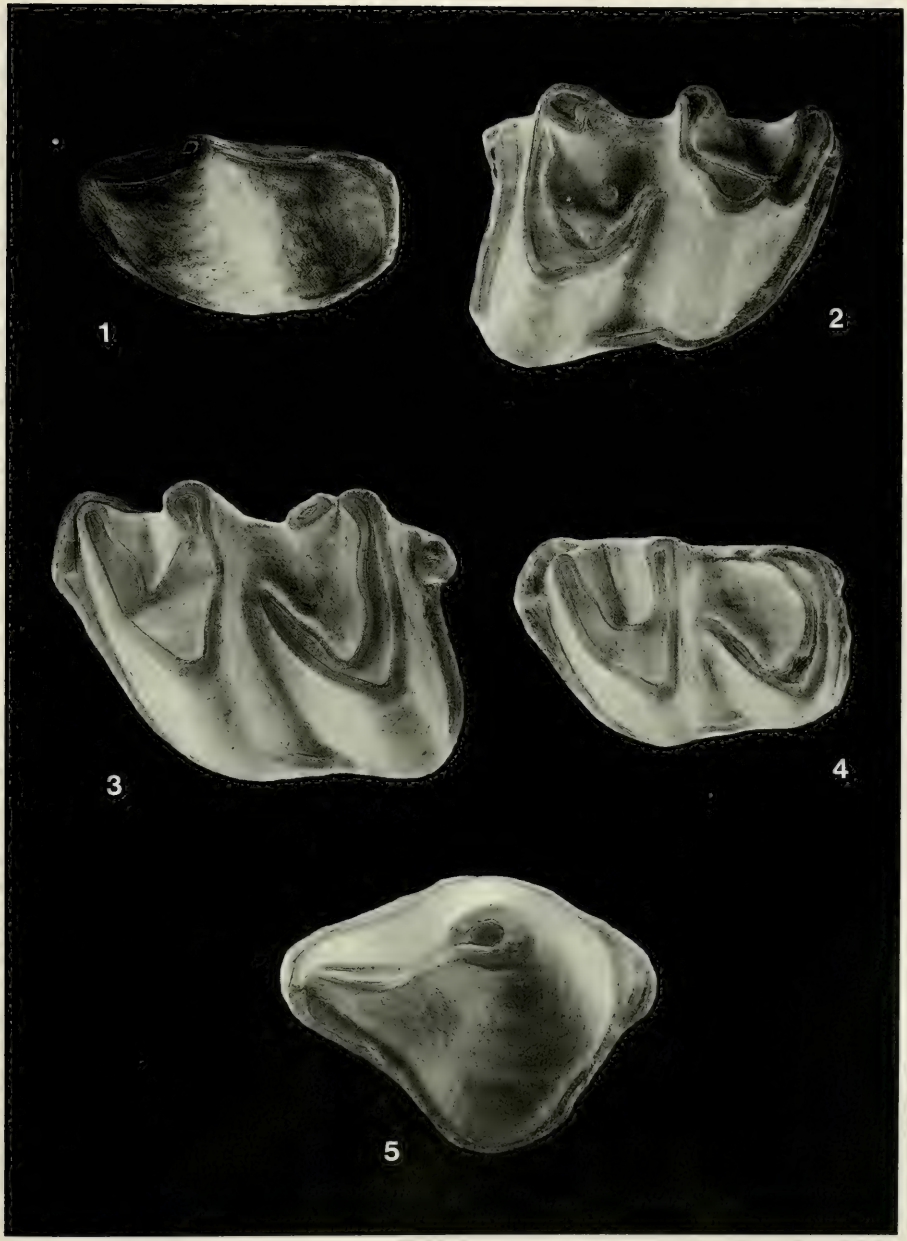


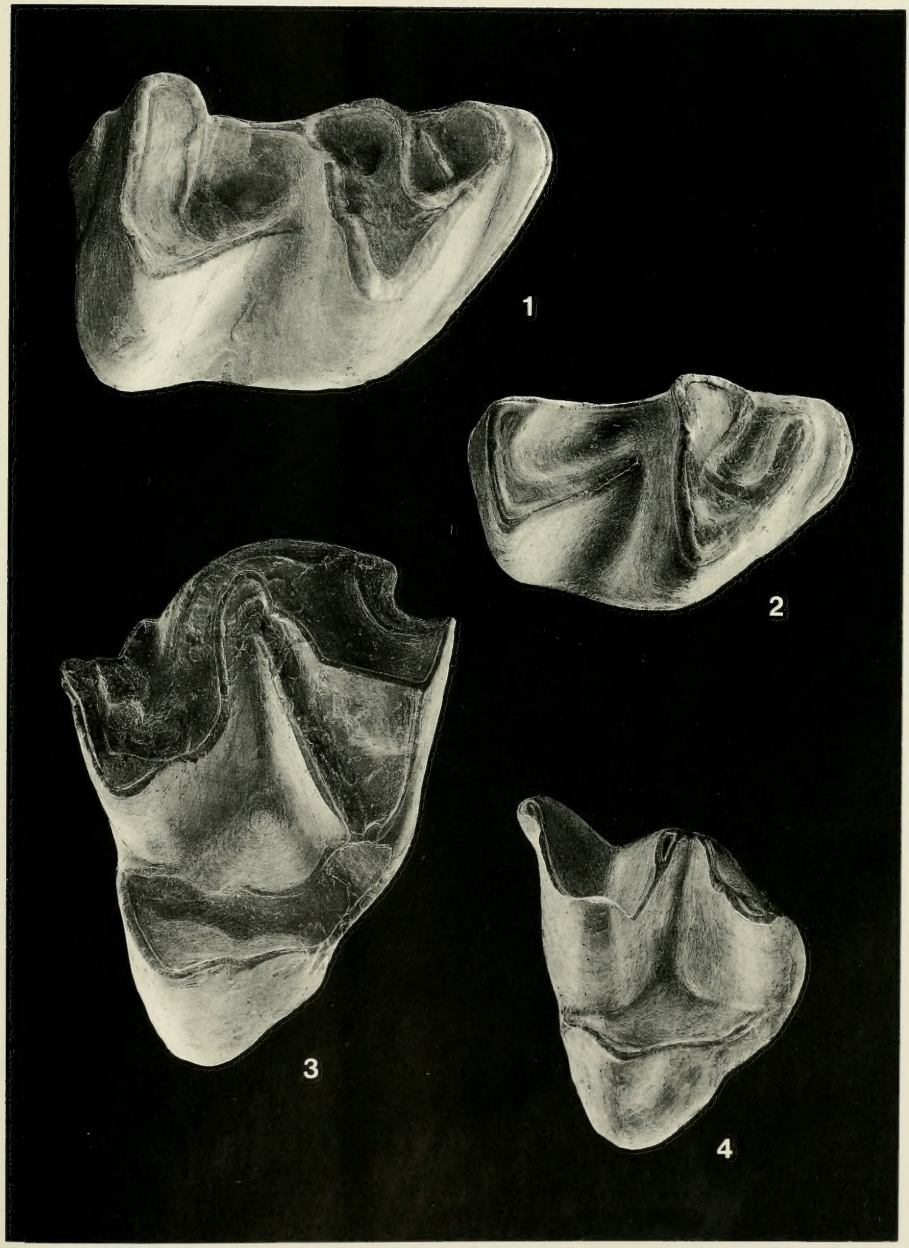
Plate 4

Geotrypus sp., Eggingen-Mittelhart 1

Fig. 1.	m2 dext.,	SMNS 44482 D1.
Fig. 2.	m3 dext.,	SMNS 44482 F1.
Fig. 3.	M2 sin.,	SMNS 44482 K1.
Fig. 4.	M3 sin.,	SMNS 44482 M1.

All figures x 25.

Plate 4



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